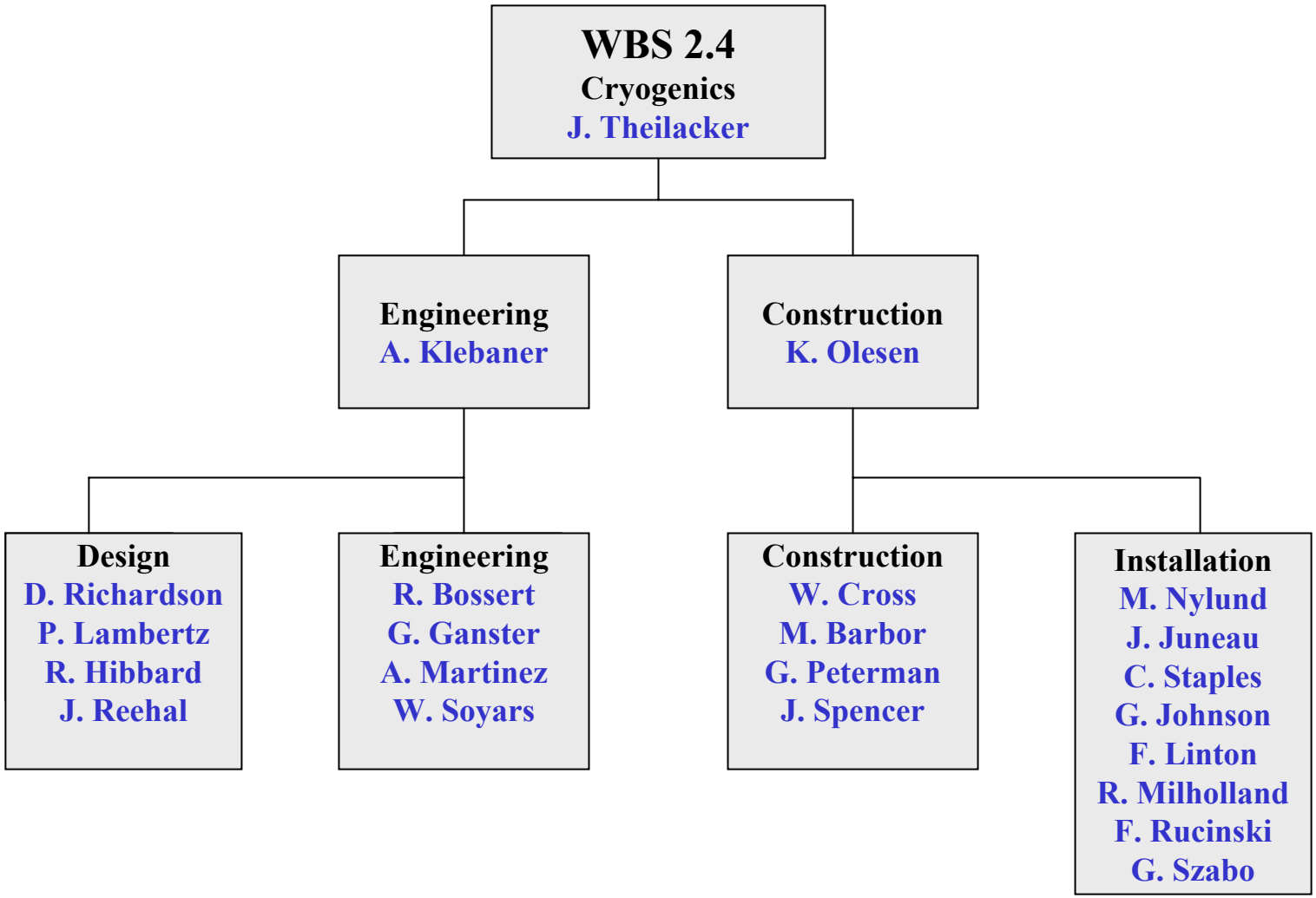
Cryogenic Elements (WBS 2.4)

Jay Theilacker

Scope of Cryogenic Elements WBS 2.4

- Design and construction of non-magnetic Tevatron cryogenic elements
  - Cryogenic bypasses
    - B48, B49, C11
  - Cryogenic spacers
    - B45/C11, B49, A48 w/BPM, B11 w/BPM
  - Cryogenic turnaround boxes
    - C10 w/leads, B49 w/o leads
- Supporting instrumentation and control for new Tevatron C0 interaction region components
  - Power lead flow control and thermometry
    - 10 new pairs of leads
- Helium and nitrogen header modifications
  - Extend or reroute headers to support new or moved components

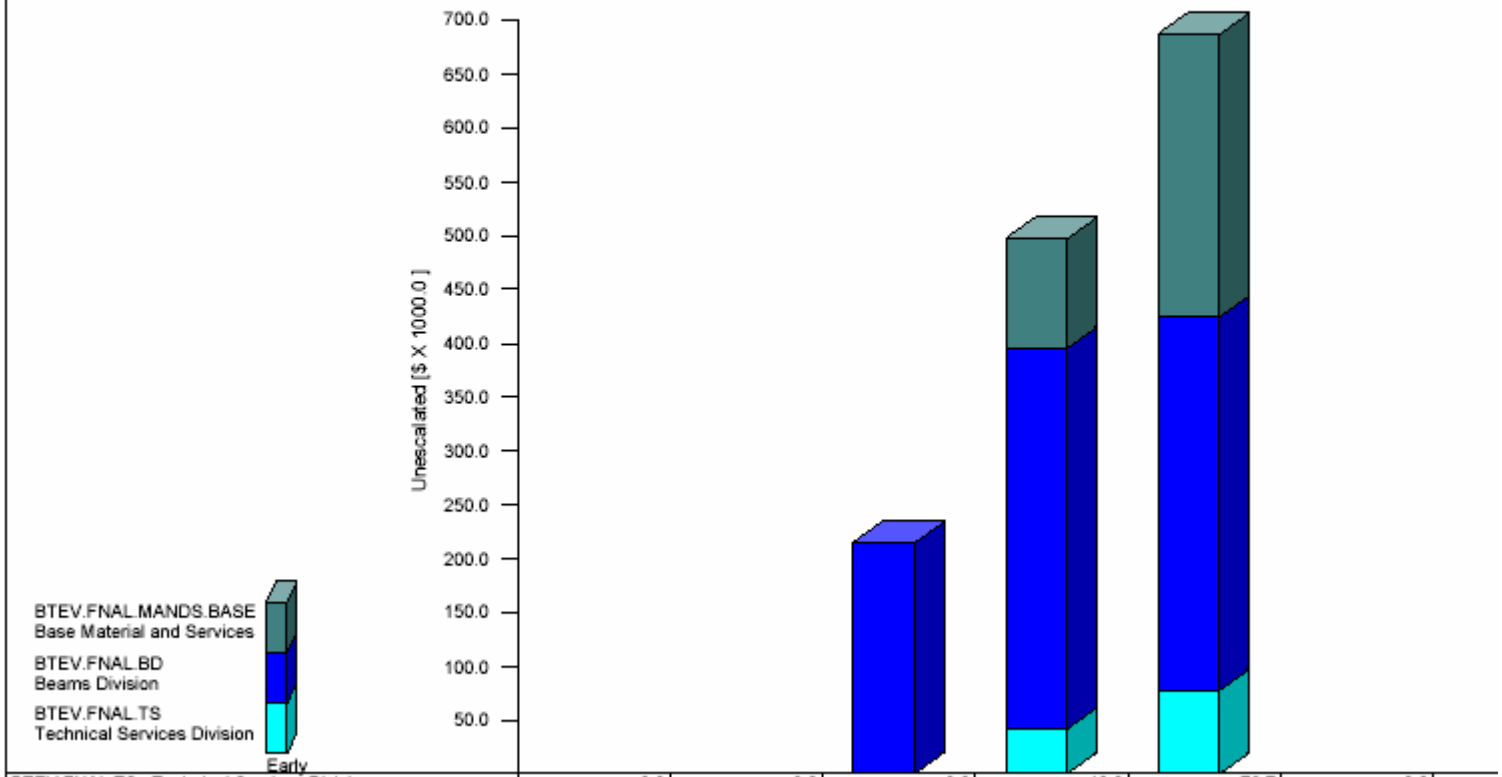

WBS 2.4
Cryogenics
J. Theilacker
Engineering
A. Klebaner
Construction
K. Olesen
Design
D. Richardson
P. Lambertz
R. Hibbard
J. Reehal
Engineering
R. Bossert
G. Ganster
A. Martinez
W. Soyars
Construction
W. Cross
M. Barbor
G. Peterman
J. Spencer
Installation
M. Nylund
J. Juneau
C. Staples
G. Johnson
F. Linton
R. Milholland
F. Rucinski
G. Szabo

Construction Obligation Breakdown WBS 2.4

WBS	Subproject	M&S (K$)	labor (K$)	total (K$)
2.4.1	Cryogenic tunnel elements	289.6	902.4	1192.0
2.4.2	Cryogenic controls mods	74.3	129.0	203.3
	Total	**363.9**	**1031.4**	**1395.3**

Total Obligation Profile by Fiscal Year WBS 2.4

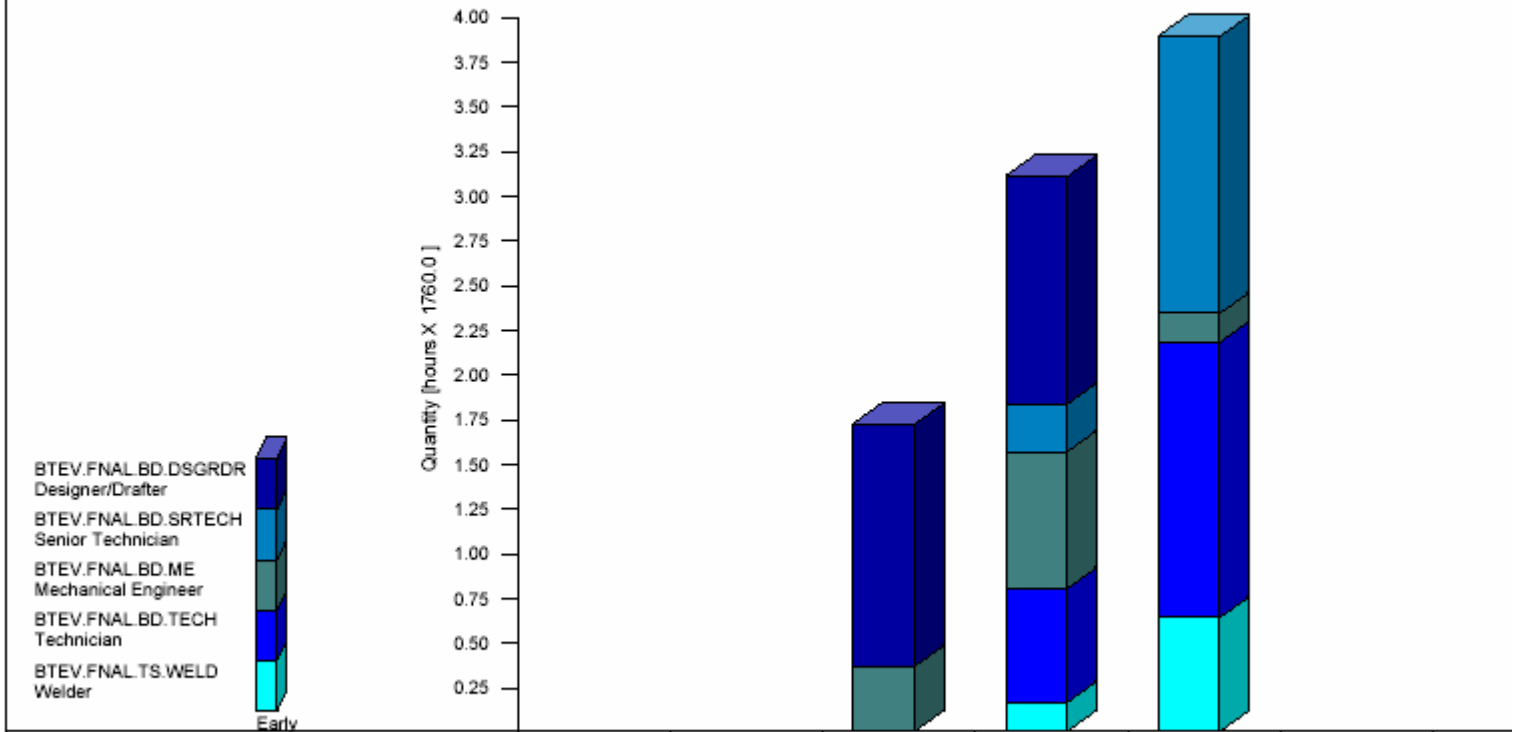
Activity ID	Activity Description	FY04	FY05	FY06	FY07	FY08	FY09	
4	Cryogenic systems			4				



BTEV.FNAL.TS : Technical Services Division	0.0	0.0	0.0	40.3	76.7	0.0	
BTEV.FNAL.BD : Beams Division	0.0	0.0	213.0	354.5	346.9	0.0	
BTEV.FNAL.MANDS.BASE : Base Material and Services	0.0	0.0	0.0	101.0	262.9	0.0	

Labor Profile by Fiscal Year (FTE's) WBS 2.4

Activity ID	Activity Description	FY04	FY05	FY06	FY07	FY08	FY09	FY
4	Cryogenic systems	4						

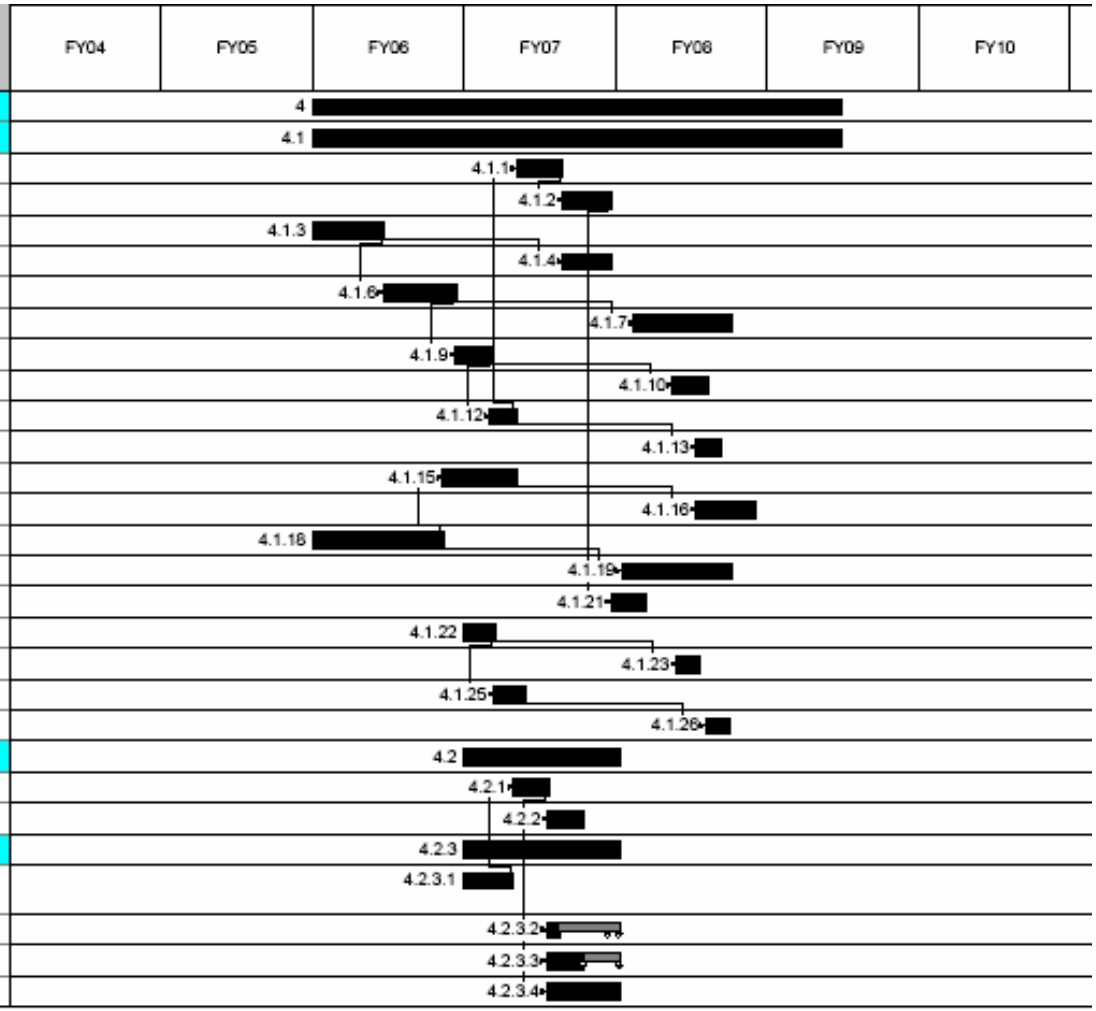


BTEV.FNAL.TS.WELD : Welder	0.0	0.0	0.0	0.2	0.6	0.0
BTEV.FNAL.BD.TECH : Technician	0.0	0.0	0.0	0.6	1.5	0.0
BTEV.FNAL.BD.ME : Mechanical Engineer	0.0	0.0	0.4	0.8	0.2	0.0
BTEV.FNAL.BD.SRTECH : Senior Technician	0.0	0.0	0.0	0.3	1.5	0.0
BTEV.FNAL.BD.DSGRDR : Designer/Drafter	0.0	0.0	1.4	1.3	0.0	0.0

Schedule

WBS 2.4

Activity ID	Activity Description
4	Cryogenic systems
4.1	Tunnel cryogenic elements
4.1.1	Design helium header modification
4.1.2	Design nitrogen header modifications
4.1.3	Design B48 bypass
4.1.4	Fabricate B48 bypass
4.1.6	Design B49/C11 bypasses
4.1.7	Fabricate B49/C11 bypasses
4.1.9	Design B45/C15 cryogenic spacer
4.1.10	Fabricate B45/C15 cryogenic spacer
4.1.12	Design B49 cryogenic spacer
4.1.13	Fabricate B49 cryogenic spacer
4.1.15	Design B49-2a turnaround w/o leads
4.1.16	Fabricate B49-2a turnaround w/o leads
4.1.18	Design C10-3a turnaround with leads
4.1.19	Fabricate C10-3a turnaround with leads
4.1.21	Header contract specification
4.1.22	Design cold BPM spool for A4
4.1.23	Fabricate cold BPM spool for A4
4.1.25	Design cold BPM spool for B1
4.1.26	Fabricate cold BPM spool for B1
4.2	Cryogenic controls modifications
4.2.1	Power lead tubing specifications
4.2.2	Cable specification
4.2.3	Controls hardware
4.2.3.1	Power lead flow control manifold design/fabrication
4.2.3.2	Power lead flow isolation hose fabrication
4.2.3.3	Power lead platinum resistor probe fabrication
4.2.3.4	Cernox thermometer and readout



Risk Analysis

Risks	Mitigation
▪ Component design errors	▪ Based on existing Tevatron component designs
▪ Insufficient cryogenic system capacity	▪ Utilizing high temperature superconducting (HTS) power leads to minimize liquefaction load
▪ Availability of existing personnel resources	▪ Long-term planning of departmental resources
▪ Installation scheduling	▪ Departmental and overall project installation shutdown planning

- Cryogenic requirements
  - The use of HTS power leads ensures a modest increase in liquefaction requirements.
  - Cold iron magnets and a new spool piece design will ensure component heat loads below standard Tevatron designs.
- Cryogenic designs
  - Standard designs will be utilized
- Cryogenic resources
  - Appropriate engineering, design and construction personnel are available throughout the required stages of the project.